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EXPERIMENT STATION
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REPLY TO: 3430 Evaluation

DATE: September 7, 1984

SUBJECT: Evaluation of Mortality on Challenge Experimental Forest

TO: Station Director, Pacific Southwest Station

As Ron Stewart requested, FPM evaluated the cause of mortality in the Indiana Ranch area of the Challenge Experimental Forest. Dave Schultz and John Pronos of my Staff examined the area on August 1, 1984 with Brad Seaburg from the LaPorte Ranger District. The enclosed report explains their findings and includes a discussion of the probable course of future mortality.

In summary, they found a group of 12-14 ponderosa pine, as well as a few scattered individual trees, that were killed by the western pine beetle in late 1983, in a very densely stocked stand. A few additional trees can be expected to die in late 1984 or early 1985 because they have already been heavily attacked by red turpentine beetle, precipitation has been below normal in 1984, and the stand is still densely stocked. In the absence of natural disasters or management activities, periodic mortality of ponderosa pine should be expected as it is slowly replaced in the stand by more shade-tolerant species. Future mortality could be reduced by thinning the overstory, reducing the understory or regenerating the stand.

Please contact Dave Schultz or John Pronos at 415-556-6520 if you would like to discuss any points raised in the report.

Wilfred L. Freeman Jr

WILFRED L. FREEMAN, JR.
Director of Forest Pest Management

Enclosure

FOREST PEST MANAGEMENT
Pacific Southwest Region

Report No. 84-35

3430 Evaluation
August 7, 1984

EVALUATION OF MORTALITY ON CHALLENGE EXPERIMENTAL FOREST

Dave Schultz, Entomologist
John Pronos, Pathologist

ABSTRACT

A group of 12-14 ponderosa pine, as well as a few scattered individual trees, were killed by the western pine beetle in late 1983 in a densely stocked stand on the Challenge Experimental Forest. A few additional trees can be expected to die in late 1984 or early 1985 because they have already been heavily attacked by the red turpentine beetle, precipitation has been below normal in 1984, and the stand is still densely stocked. In the absence of natural disasters or management activities, periodic mortality of ponderosa pine should be expected as it is slowly replaced in the stand by more shade-tolerant species. Management alternatives to reduce future mortalilty include thinning the overstory, reducing the understory, and regenerating the stand.

INTRODUCTION

The Challenge Experimental Forest is located within the Plumas National Forest and is administered by the Pacific Southwest Forest and Range Experiment Station. The Experimental Forest contains about 3,000 acres of high-site mixed conifer forest. During the past 20-30 years about 1,500 acres of the Forest has been harvested. Small pockets of recent mortalilty in a previously uncut area (Indiana Ranch) caused some Station personnel to question the need or advisability of entering the stand to salvage the dead timber. Ron Stewart, Assistant Director of the Experiment Station, requested an evaluation to determine the cause and probable course of the mortality. Dave Schultz and John Pronos, Forest Pest Management (FPM) Staff, and Brad Seaburg, LaPorte Ranger District, examined the area on August 1, 1984.

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OBSERVATIONS

The overstory of the stand examined was primarily ponderosa pine which was about 110 years old and 30 to 34 inches dbh. There were a few Douglas-fir in the overstory which typically occupied co-dominant or intermediate positions. The understory was composed of Douglas-fir, incense-cedar, white fir and tanoak A few old stumps were present which apparently pre-dated the establishment of the Experimental Forest. No diseases were noted in the stand. Increment cores from living overstory ponderosa pine showed that growth slowed dramatically during the last 15 years. Tree growth was typically 3 to 5 rings per inch during the first 20 years compared to 15 rings per inch during the last 20 years.

There was a group of 12-14 dead ponderosa pine as well as a few single dead ponderosa pine in the stand. These trees had been attacked by the western pine bettle, Dendroctonus brevicomis, and died in late 1983. The dead trees were deteriorated enough at the time of examination to have little salvage value.

No trees were seen in the stand which had been attacked by western pine beetle during 1984. There were a few ponderosa pine with fresh pitch tubes from the red turpentine beetle, Dendroctonus valens. The pitch tubes were numerous and extended up to about 10 feet, which generally indicates that the tree will be dead within a year or two. There were also some scattered dead incense-cedar in the stand. These were suppressed and intermediate trees that died slowly after many years of competition with other faster growing species.

DISCUSSION

The stands examined were at an elevation of about 2,500 ft. and had been harvested heavily and/or burned in the 1860's and '70's during mining activity. The current stands seeded in from scattered residuals which were either non-commercial at that time, or which escaped the fires. There is no obvious evidence of fire in the current stand, probably due to a combination of the moist environment created by an average of 68 inches of precipitation per year and also by fire protection in the recent past. The only evidence of harvesting in the stand are old scattered, large diameter stumps. These are probably from the trees that seeded in the current stand.

The result of this stand history has been the development of a densely-stocked overstory and a densely stocked understory which has caused tree growth to slow down. The current ponderosa pine mortality seems to be a case of succession, in which the least shade-tolerant species is being replaced by those which are more shade-tolerant. Mortality has occurred in groups because the western pine beetle has a very effective pheromone which aggregates beetles near successfully attacked trees. Bark beetles may land on other nearby ponderosa pine and overcome the tree's defenses by sheer numbers. Group kills are made even more likely by the dense stocking and slow growth in the stand.

At the time the mortality spots were examined, the dead pines had already been abandoned by the western pine beetle. These spots did not contain any insects or diseases that are currently a threat to adjacent trees. Removal of the dead

trees would do very little to influence future mortality in the stand. A few ponderosa pine in the stand had been heavily attacked by red turpentine beetles. The western pine beetle will probably attack and kill these trees in late 1984 or early 1985. This could result in a few additional "healthy" trees being killed by western pine beetles that are attracted to the area by aggregating pheromones. The potential for additional mortality could be avoided by removing the trees infested with red turpentine beetle before they come under further attack, but the small number and scattered nature of these trees may make a commercial sale unfeasible.

The mortality which has already occurred has probably benefitted an extremely localized area by acting as a thinning. The biological and environmental conditions that promoted the mortality, however, have not been altered throughout much of the stand. Additional mortality should be expected at some point in the future unless the stand structure is altered.

MANAGEMENT ALTERNATIVES

1. Do Nothing. This assumes the stand would not be entered and it would be preserved as a reference stand or to observe succession. A few additional trees should be expected to die in late 1984 or early 1985 because they have already been heavily attacked by the red turpentine beetle, precipitation has been below normal in 1984 and the stand is still densely stocked. The basal area of the stand will continue to increase with time, and the stress on individual trees will likewise increase. Ponderosa pine will slowly decrease in number because it does not regenerate well in shade. The western pine beetle is quite efficient at killing individual overstory pines or small groups of trees which are under stress. Douglas-fir and incense-cedar are likely to persist in the stand for the forseeable future because they can regenerate and survive in shade for many years. Also, the bark beetles and borers which commonly attack these species in the Challenge area tend to be successful only in trees which are severely declining. Tanoak is thriving in the area because of a general lack of pests and its ability to sprout and survive in shade. In the absence of fire or harvesting, the stand will probably shift toward a tanoak Douglas-fir stand with a few scattered conifers of other species. If the stand is preserved solely for reference purposes, it will have a rather restricted usefulness because the Region has few mature second growth mixed conifer stands growing on such high sites.

2. Thin the overstory. The current stocking offers an excellent opportunity to commercially thin the overstory and still leave an adequately stocked stand. Thinning should lower the probability of mortality by increasing the growth and vigor of the leave trees. The benefits of thinning should not be expected to last beyond 10 to 20 years because some understory tanoak and conifers will be released during thinning and because the basal area of the leave trees will increase with time.

3. Thin the understory. The current overstory is too dense for optimal growth, but it could probably be supported if it was not competing with the understory for water and nutrients. The overstory would probably increase in growth and vigor, and decrease in susceptibility to bark beetles if the understory and suppressed trees were reduced.

A. Mechanical harvesting. The easy access and gentle terrain would make it possible to mechanically harvest the understory for biomass or chips. It is not known whether the volume and size of the material currently present would make such an operation economically feasible or whether current market conditions could support it. Tanoak could be expected to re-sprout rapidly and resume competition with the overstory.

B. Prescribed underburning. Areas near the Experimental Forest on the Plumas National Forest have been underburned in the early spring, and resulting mortality and damage to the overstory was very light. While there was some reduction of the understory, many suppressed trees survived and the tanoak sprouted rapidly. Additional treatments may be necessary to achieve the desired result.

C. Manual weeding. The most selective method of reducing competition would be to manually cut, inject or spray the undesirable vegetation. Costs would probably be higher than the use of mechanized harvesting or prescribed fire. Rapid regrowth of the tanoak would be expected without the use of herbicides.

4. Regenerate the stand. The stand is currently at or past rotation age established for National Forest lands in much of California. Current stem diameters are much larger than those expected in future rotations and are also larger than the capabilities of most small log sawmills. The stand is also well past the point of culmination of mean annual increment. This suggests that if the management objective for the land is to produce meaningful information for the future, then the most logical treatment is to regenerate the stand. A young replacement stand would generally be less prone to mortality than the current one.